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ABSTRACT

This paper describes a revised teacher training program that includes Internet-based learning materials, thus demonstrating the dual mode system in which both off- and on-campus studies are integrated. The first section discusses the changing role of the teacher, including traditional teacher education and new challenges imposed by technology. The dual mode learning environment is covered in the second section, including the use of the Internet and the importance of student activity. The third section addresses the focus on practice, including a platform of knowledge and learning theories for PBL (Problem Based Learning) and CSCL (Computer Supported Collaborative Learning). Preparing teachers for open and flexible learning is covered in the fourth section, including introducing ODL (Open and Distance Learning) in teacher education; the PiOL (Pedagogy in Open Learning) online course; and a basic course on "Learning-to-Learn through ICT" (Information and Communication Technology). Resources on the Internet are summarized in the last section. (MES)

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Shifting Focus from Teaching to Learning - ICT as an incentive to reform teacher education

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Abstract: New information technology introduces new challenges for the teachers - and also for the teacher training system. To make the new teachers really understand what the new learning environment is all about, they should be exposed to the new methods during their own training process. Therefore our revised teacher training programme includes netbased learning material, thus demonstrating the *dual mode* system, where both off and on campus studies are integrated. The close relation between training and *practice* is focused as well as *PBL* and *CSCL* methods. Students should also have an introduction to how netbased learning material is constructed, the *pedagogy of open learning*, and be given an overview of *services and tools* available on the net. All of these fields are subject to rapid development, and have to be revised continuously.

Changing role of the teacher

Traditional teacher education

Teacher education varies between different countries and cultures. A general goal, however, seems to be that the students in a teacher training situation are supposed to acquire sufficient subject and pedagogical knowledge to conduct the learning process of their future pupils. The teacher's role in primary school is often a mixture of a *sage on the stage*, an entertainer and a social worker. At secondary - and higher - levels, the subject content is more focused, and the goal is often to transfer as much of the teacher's knowledge as possible to the pupils. The tradition is to tell them, ask them to read books and keep them on their toes by requiring exercises done and giving test. The role of the pupils is traditionally that of recipients and accumulators of knowledge and skills.

Training of new teachers is done by much the same methods, only at a different level. Experienced professors and senior teachers are striving to transfer their own knowledge, experiences and skills to new generations of teachers. The teacher training is in itself a conservative process, keeping up traditions that '- have always worked.' New research and findings have led to new trends and methods, but the system of knowledge transfer persists. Now the time may have come for a real change, perhaps a new paradigm.

The new role for the teacher

The introduction of new technology does not imply that the teacher may leave his duties to the computer. Instead of being the sage on the stage, however, he is rather expected to guide his pupils to acquire know-

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ledge from a variety of sources - many of them available through Internet. For new teachers to manage this role they should themselves have experience from these kinds of learning environments.

Technology & challenges

Learning environments based on new technology impose new challenges on the teachers - and on the teacher training system. Advanced and broad band networks, PCs being able to present sound and graphics, animations and video as well as texts and simulations, call for new skills and approaches by the teachers. To an even higher degree this also goes for teacher educators. The technology is there, but how does the academic staff, may be in their fifties, manage the new challenges? Is it easiest to continue the traditional way? We have tried out some ways to change the system.

Dual Mode Learning Environment

Over the past eight years we have developed courses that gradually have evolved from traditional lectures in the classroom, to Open and Distance Learning (ODL) courses. We have developed, implemented, tested and evaluated different models where the physical location of the student is of less importance with respect to how the content shall be presented and taught. Work has been directed towards a situation where a student is a student, no matter whether he or she is actually an internal or an external student. The focus is on what methods to use in working with the content. This means in practice that internal and distant students are participating in the same courses and working with the same material. An important goal for this work is to make models for teaching which is the same for both on-campus and external students, a dual mode learning environment where internal and external students interact and work together. By introducing this model new ways of teaching on-campus have also been found, with the clear intention of making internal students more responsible for their own learning, where the teachers are tutors or guides in the learning process. Different tools have been tried to make an interactive learning environment a place where the students take part.

Internet

Most of learning material, exercises and assignments, are distributed through Internet. In this material are included references to books and URLs, integrated video shots to illustrate actions etc. The Internet is also used as a forum for discussion, exchange of views and experiences with the learning material and assignments. This is building an electronic learning environment where both learning material and student work are presented and discussed.

The contact with the students is also kept electronically. Student assistants and teachers are available for net based interaction and guidance, and tools like IRC are used to create co-operating groups. This is done both for external and internal students. Teaching in the classroom is no longer dominated by the teacher with students as passive listeners. The Internet is gradually becoming an arena for teaching and guiding, where problem based learning methods are dominant.

Student activity

By including interactivity in the course material students are forced to be active and to take part in the course. In some courses the material is "opened" to the students, encouraging them to add information to the content, ask questions, show examples and present personal experience directly in the material, not in a separate newsgroup. This is done by letting the student make *annotations* to the material. This is making the curriculum a "living" and dynamic learning environment, and not a static material made once and for all by the teacher. To make this evolving material, a tool called WebOrama is developed as part of the SHARP project (http://www.softlab.ntua.gr/sharp/). Annotations made by students are available to all participants.

The attitude among internal students is still often based on behaviouristic learning theory and the belief that the best way of learning is to be taught by a teacher. The traditional *delivery* of facts and scientific material in the classroom, or over the Internet, should not be thought of as learning. Such lessons should be considered as information. The students have to interact with the material to acquire knowledge. Focussing on constructivistic learning theories and not on delivery of information the teachers invite the students to work on the entire course to construct their own knowledge.

During the first stages the students may be slightly confused, and have problems to get started. Many students need some time to adjust to this new way of working, with courses mainly based on student activity and the teacher as a guide. But the feedback from the students shows that after adjusting to this way of studying, they find it to be an efficient way of working and learning.

In our courses we focus on using the Internet as an interactive working arena. Internet must not be used as an excuse for presenting linear text, but as a tool to increase student activity. If knowledge is gained through work, Internet must be more than a delivery system for information. It has to be a place for work and active learning.

Focus on Practice

One of the main dilemmas in teacher education, and in other kinds of professional education as well, is and has for a long time been, finding the correct balance between theory and practice. There is a tradition for discussing these problems among students, teachers and philosophers of pedagogy. The counterparts in this discussion are on those who will place the learning situation on the university or college campus, and on the other side, those who will make practice the main arena for teacher education. In Norway it may be that until now the first group has won this discussion. Teacher education is and has for years been a theoretical and academic kind of education - with some practice added. There has been a gap between theory and practice. Even though educators have spent a lot of efforts to bridge theory and practice, there still seems to be a fear that increased focus on practice will reduce the academic quality of the education, and thereby reduce status for teaching as a profession. This is often described as the "fear of tyranny of experience" (Kvernbekk, 95, Weniger, 90), trying to avoid a teacher education where "practice is enough, and one doesn't need theory". It is difficult to understand this fear. A practice-based teacher education could as well be based a theory. By placing the theoretical reflection in the context of practice, the reflection will obtain a new dimension.

In general there are two main perspectives on the theory-practice relation. The first is to consider practice as an application of theory. This is usually how the students understand theory, as some kind of recipe for their own teaching. Among others Donald Schøn is distinctly critical to this way of thinking. He characterizes this as "Technological Rationality", a way of thinking based on the view that a scientist should develop general principals that the practitioner should follow. Schøn points out that this creates a totally wrong image of what practical competence is. He is concerned with the distance that exists between a discipline's technical rationality and the experienced practitioner's reflection in action and the research based reflection on action (Schøn, 86). The Swedish language researcher, Ingela Josefson, points out that the main question should be: "How can we secure that practice impress the theory-lessons" and not "How can we secure that theory lessons impress the students practice."(Josefson, 91) This is a constructivist point of view. Theory should also be something, that students construct by themselves, not always something served to them as general, established knowledge. A new practice-based approach to teacher education is suggested based on the didactic concepts of Problem Based Learning, within the framework of Computer Supported Collaborative Learning.

A platform of knowledge- and learning theories for PBL-based CSCL

Problem Based Learning (PBL) is derived from the older "case-study method" and is introduced as a fundamental pedagogical method, a model and concept initially applied in different fields of health education. One of the founders of the PBL term, Howard Barrows, points out 3 main goals for PBL:

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- Students should achieve knowledge they can use in their professional work
- Students should be responsible for their own learning
- Students should develop skills for problem-solving

One common demand of a PBL environment is that the learning activity should reflect well known scientific thinking and methods. The working model is called "the 7 steps" (Pettersen, 97), with references back to John Dewey's ideal-model for problem solving (Dewey, 33). According to Timothy Koschmann the acronym CSCL has been established as a designation of an emerging paradigm within the ICT-area. Very briefly Koschman characterizes the CSCL-paradigm as a paradigm with focus on

> *.. the use of technology as a mediational tool within collaborative methods of instruction (Koschman,96,p2).*

According to Koschmann previous paradigms approach learning and instruction as psychological matters (Computer assisted instruction (CAI), Intelligent Tutoring Systems (ITS), and Logo as Latin). CSCL is built on the research traditions of disciplines that are devoted to understanding language, culture and other aspects of social settings, like anthropology, sociology, linguistics and communication science. The foundation of this learning theory is within the tradition of the Soviet socio-cultural theories and Vygotskys *Theory of cultural historical psychology* with references to the movement of social constructivism. On the other hand the paradigm combine insights from the Vygotskian school with insights from American pragmatism, represented by Dewey and Mead, and the contemporary work of sociologists and anthropologists like Rogoff and Lave and theories of situated learning and situated cognition.

PBL and CSCL may be placed on a common platform of learning theories supported by three pillars:

- The learning psychology pillar: *social constructivism*
- The learning theory pillar: *situated learning*
- The knowledge-sociology pillar: *critical pedagogy and project-organized learning*

These pillars are tied together within the epistemological framework of Wittgenstein, Polanyi and Schøn with focus on the relationship between tacit and focal knowledge.

Why CSCL and PBL?

Timothy Koschmann et. al. sketch up a theory-based (not technology–driven) approach for design of CSCL-tools, applied within the framework of Problem-Based Learning and the context of medical education. They call this approach Computer-Supported Problem-Based Learning (Koschmann , 96, p.83). The main argument for introducing this approach to medical education is the complexity of the domain, handling ill-structured problems in ill-structured domains. The characteristics of ill-structured problems are, according to Barrows and Feltovitc, primarily the dynamic character of this kind of problems. Problems unfold over time and change as new information is obtained. Secondly there are several ways of solving a problem and collecting information, relevant for the solution. Finally, there will be no "one and only" solution to this kind of problems, and decisions have to be taken in the absence of definite knowledge (Barrows and Feltovich, 1987). Koschmann et.al. point out the special challenge that education related to ill-structured domains represents:

> *For example, because of the problem of multiclassifiability and the irregular patterns of features across cases of the same type, classification of cases cannot be done in any simple regular manner. Further, teaching conceptual knowledge in the abstract will not prepare the student for the concepts' variations and combinations with other concepts that practice will demand. Finally, each problem that challenges performance is unique with respect to the definitive parameters that it lacks and the possibilities for their definition. (*Koschman et. Al , 1996, p-87*)*

The PBL-approach has been spread widely within health education both as a method and as a didactic basis for educational institutions within the field. The same has not happened within teacher education, in spite of the fact that constructivism as philosophy in general has deep roots in the pedagogical environment within teacher education. Somehow it may be said that the teacher educator *preaches* constructivism where the health care educator *practices* constructivism. Is there a difference between these kinds of education that

could explain the different ways of implementing a problem based concept or is this just a matter of traditions? There is no simple answers to this question. Most likely the answer is that there is a combination of causes. The main reason for the differences seems to be related to how problems emerge within the education. In education of health personnel it is relevant to define problems as cases and look for the treatment of the defined cases. This is a very concrete starting point which for example fits well to the 7 steps process prescribed for Problem Based Learning.

In teacher education there will be an extra didactic meta-layer and therefore less focus on 'finding solu- , but rather point out directions for making a suitable learning environment. This will be on a more abstract level than proposing concrete treatment of a patient. A consequence is that the problem defining process in teacher education in many cases has to be more complex.

Another problem is that the traditional organization of the main practice field, primary and secondary schools, give little support to a didactic based on constructivism. It could be considered as a paradox to use a constructivist approach in educating teachers for a non-constructivist practice. On the other hand, it could well be the only way to turn practice towards constructivism by starting education of new teachers in a different way.

Preparing teachers for open and flexible learning

Introducing ODL in Teacher Education

To introduce this new concept in teacher training, the most natural way should be to train them by teaching them ODL through ICT based ODL. Learning by doing has always been a sound principle. In this case there may be an alternative approache to expose them to a basic course on 'Learning-to-learn through ICT', where the first, introductory part is presented in a traditional way, either as a face-to-face course in a lab or as a printed text. After one or two sessions of this kind, the rest of the course is delivered on-line, by ICT. This way they should be able to compare the two methods and also have to learn to make good use of other on-line courses.

Pedagogy in Open Learning, PiOL

The other alternative is to offer a course on how to construct ICT based ODL material by attending an Internet course that demonstrates the content. The course provides a basic understanding for newcomers in the field of course ware development, and will hopefully also demonstrate new ideas for the more experienced developers. This on-line course on *Pedagogy in Open Learning* has been offered to national and international audiences since 1996. Every term it has undergone some revisions and has gradually evolved into the form it has now. A major objective is to provide *guidelines* for the development, implementation and running of open and flexible, net-based learning environments. These guidelines are based on experiences from user trials and evaluation of several national and European projects, as well as on theoretical discussions.

Resources on the network

Netbased studies are based on a multitude of tools and resources. Some of the central, on-line 'assistants' are mentioned below.

A distinction is made between *educational pages and supporting pages*. An important goal is to stimulate communication between students, between students and tutors, and between students and teachers. Information about the assignments, extra help and answers to the questions are available on the web-site through the lessons, the discussion groups, *the IT recipe book*, the *Topic Search"* ,the *Oracle-service* and the *Note Book*. The web pages are divided into public and non-public pages, where non-public pages are protected by password.

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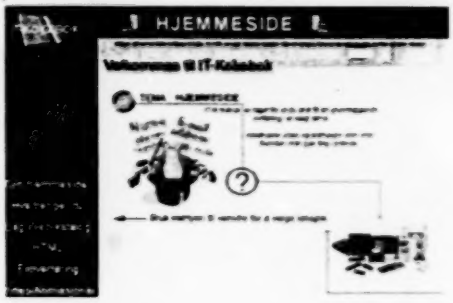
IT recipes book (cooking book), Topic Search, Oracle-Service and Note Book

The *IT recipes (cooking book)* is a tool for students that need extra help when it comes to topics like using a browser, making homepages etc. The IT-cookbook offers an introduction to the chosen theme on a basic level and provides the students with a number of different topics, known to be difficult to previous participants of the course (How to make their own homepages etc.). Each topic consists of explanations, directions, video and animations to show the students how to practice it themselves. In addition to the lessons and animations/ videos, the IT-cookbook also offers an encyclopaedia, explaining over 4000 words within computer terminology.



Topic Search, Oracle-Service and Note Books

The *Topic Search* is formed as a text-search where the students can search through the lessons of their course (both new and previous editions) for an explanation of a word or phrase. The search then gives the opportunity to go through the lessons and find the context in which the word or phrase appears, or an explanation to the word/phrase. The results appear as links to the various lessons that match the search.

Through the *Oracle-Service*, the student can get the answer to his/her question concerning the course, within a short period of time. The answer is given through e-mail. The oracle-service shows the status of the tutors, who are online/offline or occupied, at all times. The panel of the oracle-service consists of the course providers and several assistants.

With less and less hours where the students actually see each other, it is important to create a feeling of community, and each student contribute by making own personal *note book* during the start-up phase of the course. In these personal *Note Books* (available to all the students), they write about their own experiences during the course. By this the feeling comes that the course site belongs to every participant and grows with each individual contribution. It becomes a true *evolving knowledge base*. Through the personal note books, the participants have a unique possibility to inspire each other and give each other feedback during the course.

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